# MATH 532, 736I: REVIEW INFORMATION FOR TEST 1

## What to Memorize:

- Know the axioms for a finite projective plane of order $n$:

  **Axiom P1.** There exist at least 4 distinct points no 3 of which are collinear.

  **Axiom P2.** There exists at least 1 line with exactly $n + 1$ points on it.

  **Axiom P3.** Given any 2 distinct points, there exists exactly one line passing through the 2 points.

  **Axiom P4.** Given any two distinct lines, there exists at least one point where the lines intersect.

- Know the axioms for an affine plane of order $n$:

  **Axiom A1.** There exist at least 4 distinct points no 3 of which are collinear.

  **Axiom A2.** There exists at least 1 line with exactly $n$ points on it.

  **Axiom A3.** Given any 2 distinct points, there exists exactly one line passing through the 2 points.

  **Axiom A4.** Given any line $\ell$ and any point $P$ not on $\ell$, there is exactly 1 line through $P$ that does not intersect $\ell$.

- Be able to prove that in a finite projective plane of order $n$, there exist exactly $n^2 + n + 1$ points and exactly $n^2 + n + 1$ lines. (In class, we used some results already established about projective planes. These results would be stated on the test.) See Test 1 from 1992, Part I, Problem 3.

- Be able to prove that if $\ell$ is a line with exactly $n + 1$ points on it in a finite projective plane of order $n$ and $A$ is a point not on $\ell$, then there exist exactly $n + 1$ lines passing through $A$. See Quiz 2 (2011) and the Answers to Quiz 2 (2011).

- Be able to prove that in an affine plane of order $n$, for each line $\ell$, there are exactly $n - 1$ lines parallel to $\ell$. See Test 1 from 1993, Part I, Problem 6.

- Be able to prove that in an affine plane of order $n$, each point has exactly $n + 1$ lines passing through it. (The lemmas done in class will be given to you.) See Test 1 from 1994, Part I, Problem 6.

## What to Also Know:

- Know how to show that an axiomatic system is consistent, independent, and/or complete.

- Know how to make dual statements and know the principle of duality.

- Know how to construct finite projective planes and finite affine planes of order $p$.

- Know how to make incidence tables.

## What NOT to Know:

- Geometric constructions with straight edge and compass

- Examples illustrating modulo arithmetic (other than construction of projective and affine planes)